# The Amphibian Research and Monitoring Initiative in the Upper Mississippi Region

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## Abstract

The Upper Mississippi Region of USGS's Amphibian Research and Monitoring Initiative includes 13 states in the Upper Midwest. Since 2002, we have been surveying for amphibians primarily in three areas managed by the Department of Interior: the Upper Mississippi National Wildlife and Fish Refuge Complex (Refuge), the St. Croix National Scenic Riverway (Riverway), and Voyageurs National Park (Voyageurs). Our efforts in the latter two areas are part of a joint effort with the National Park Service's Inventory and Monitoring Program that also includes inventories of reptiles. We survey for amphibians in 25-ha blocks of habitat selected randomly in each management area with known areas of inference. We conduct standardized visual and call surveys in all three areas and also survey via cover boards in the Riverway and Voyageurs. As of 2003, we have located breeding sites for 10, 13, and 11 species of amphibians in the Refuge, Riverway, and Voyageurs, respectively. We have observed relatively low frequencies of mortality, deformities, and disease thus far. We are also surveying for Blanchard's cricket frog, reportedly declining in northern parts of their range, in the Refuge and other areas and began screening breeding sites for atrazine in 2003.

## Introduction

### *ARMI and the Upper Mississippi Region*

- The Amphibian Research and Monitoring Initiative (ARMI) was created in 2000 by Congress and President Clinton.
- USGS has primary responsibility for implementing and managing ARMI.
- The goals of ARMI are to:
  - assess the statuses of populations of amphibians (principally on lands managed by DOI),
  - understand the scope and severity of declines,
  - determine the causes of declines,
  - and provide essential scientific information to enable effective management actions.
- USGS created a conceptual model (Figure 1) of how to study populations of amphibians in relation to declines.
- A biologist from a USGS science center in each ARMI region (Figure 2) conducts and coordinates studies in that region.
- We began conducting the ARMI studies described here from the Upper Midwest Environmental Sciences Center (UMESC) in La Crosse, WI (Figure 3), in 2002.

**ARMI Conceptual Model**

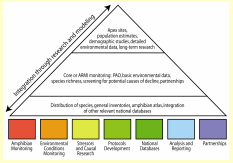


**Figure 1**

**ARMI Regions**

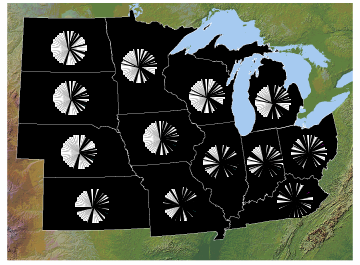
**Figure 2**

**UMESC**

**Figure 3**

### *Species Distributions, Concerns, and Declines*

- ~ 76 species of amphibians live in the 13 states of the Upper Mississippi Region (Figure 4).
- State DNRs and NGOs (1, 2) are concerned about the statuses of several species (Figure 5).



Few or no rigorous data exist for most populations.

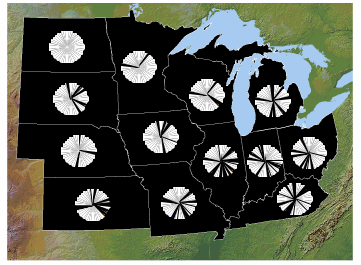


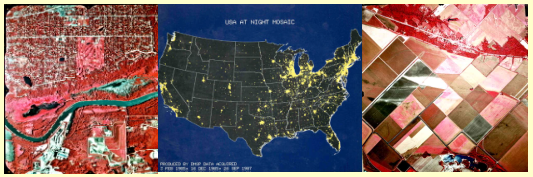
**Figure 4** **Figure 5**

- Scientific (3) and widespread anecdotal information suggests several species have declined in this region over the past several decades.
- *Acris crepitans blanchardi* (Blanchard's cricket frog) has declined dramatically in recent years throughout most of the northern parts of its historical range.
- Deformities are widespread, but generally low in frequency and inconsistent over space and time.

### *Potential Threats*

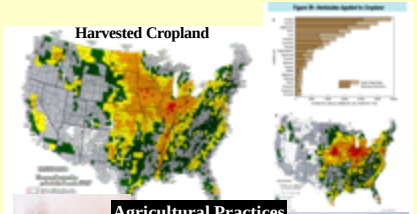
- Several factors could cause populations to decline in this region, including:

**Habitat Loss and Fragmentation**



**Climate Change**

**Harvested Cropland**



**Agricultural Practices**

Field studies (4) in 2001 suggested that exposure to atrazine was associated with abnormal gonadal development in *Rana pipiens* (northern leopard frog).

### *General Objectives*

1. Determine what is known about the statuses of populations of amphibians in the region.
2. Survey and monitor populations of amphibians and their habitats in at least three DOI areas.
3. Survey for Blanchard's cricket frogs to establish apex sites to study potential causes of declines.
4. Conduct initial studies of exposure to herbicides and developmental effects in n. leopard frogs.

## Materials and Methods

### *Obtaining and Evaluating Extant Data*

• Reviews of the scientific literature; solicitations of data from Federal and State agencies; participation in local, regional, and national meetings and conferences

### *Surveys and Monitoring*

Field Sites

• The Upper Mississippi River National Wildlife and Fish Refuge, the St. Croix National Scenic Riverway, and Voyageurs National Park (Figure 6).

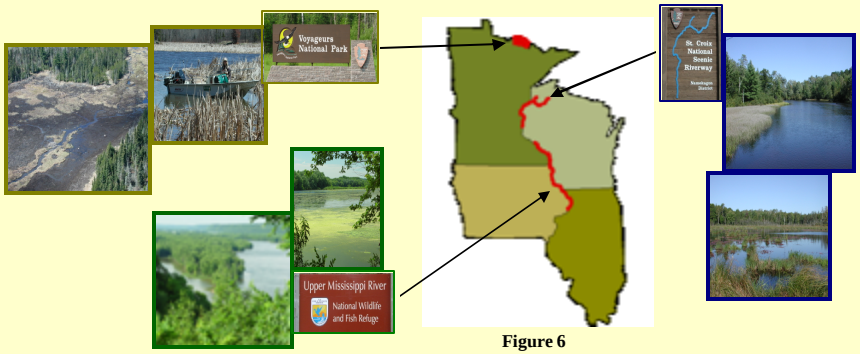



**Figure 6**

Sampling Design

• Surveys of breeding sites in 25-ha cells selected randomly (Figures 7a, b) and conducted over three sampling rounds in each management unit (Figure 8)

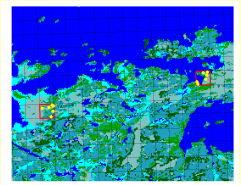


**Figure 7a**

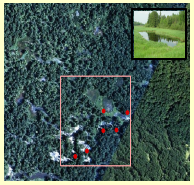


**Figure 7b**

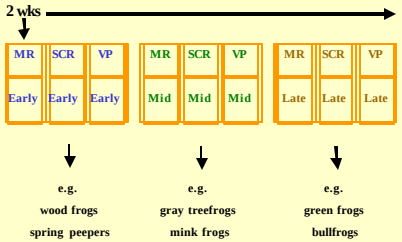



**Figure 8**

Survey Methods

• Timed call and visual encounter surveys, cover boards, and measurements of habitat variables

### *Extensive Surveys for Blanchard's Cricket Frogs*

• Call surveys in historical and potential habitats in MN, WI, IL, and IA

### *Initial Studies of Exposure to Triazines*

• Analyses (all via ELISA and seven via LCMS) of water samples collected once from each of 100 breeding sites and collections of metamorphs from seven sites

## Results and Discussion

### *Obtaining and Evaluating Extant Data*

• Federal and State organizations survey breeding amphibians annually in several states, primarily via call surveys. Methods and expertise vary. We continue to obtain and evaluate data from these sources to better understand the information they contain and their comparability to ARMI data.

### *Surveys and Monitoring*

Figures 9 - 16

Land Cover

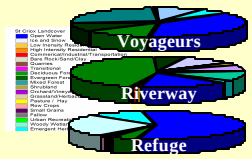



**Figure 9**

# of Cells, Sites, and Species Sampled
2002 and 2003

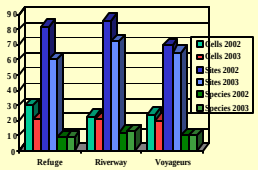



**Figure 10**

Water Chemistry
(only sites sampled 3x)

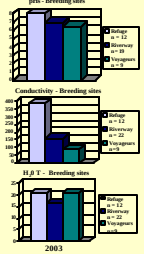


**Figure 11**

Species Observed
2002 and 2003

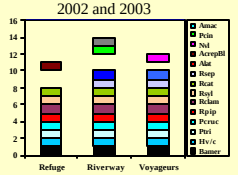



**Figure 12**

% Of Sites Where Species X Was Observed
2003 (only sites sampled 3x)

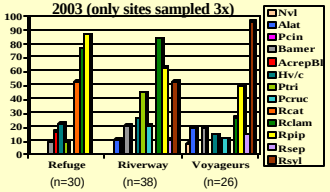



**Figure 13**

% of Sites with X # of Species
2003 (only sites sampled 3x)

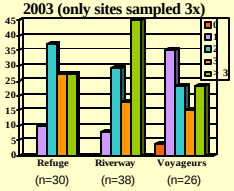



**Figure 14**

% of Possible
Species Observed

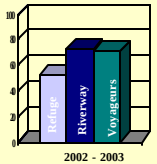



**Figure 15**

Deformed Metamorphs
All Species, All Sites

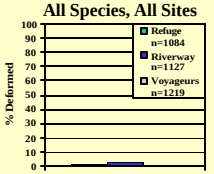



**Figure 16**

### *Extensive Surveys for Blanchard's Cricket Frogs* (Figures 17,

• We did not observe Blanchard's cricket frogs in northern portions of their historical range (Figure 17), including in the Refuge (Figure 18).

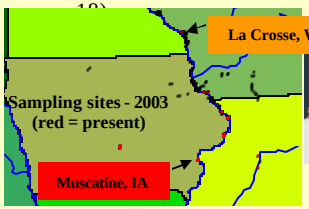



**Figure 17**

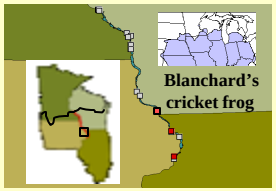



**Figure 18**

### *Initial Studies of Exposure to Triazines* (Figures 19, 20)

• We detected triazines more often and in greater concentrations in the Refuge, which is located nearest to large areas where atrazine is applied (Figure 19).

• We have yet to analyze metamorphs collected.

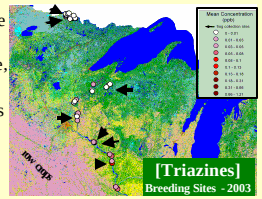



**Figure 19**

• Non-detectable samples were consistent regardless of analytical method or filtering.

• Detectable concentrations varied with both (Figure 20).

Methods Comparison

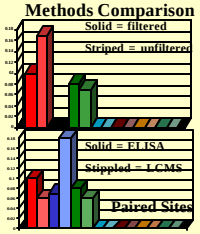



**Figure 20**

## Conclusions

1. Data collected via other monitoring programs are widespread, but vary in quantity and quality.
2. Populations of several expected species are distributed across our study areas, but we cannot yet speak to any trends. Many other species and areas require study.
3. Our observations corroborate evidence that Blanchard's cricket frogs have declined.
4. Several species in the Refuge were exposed to triazines more than in the Riverway and Voyageurs.

## Literature Cited


1. As described in Lannoo, M. J. 1998. University of Iowa Press. Iowa City, IA
2. Web sites - State Departments of Natural Resources of several states; NatureServe (http://www.natureserve.org/)
3. Lannoo, M. J. 1998. University of Iowa Press. Iowa City, IA
4. Hayes et al., 2003. Environmental Health Perspectives111(4):568-575


## Acknowledgments


• National Park Service – Inventory and Monitoring Program

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